UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/772,655	02/05/2004	Yun Luo	TRW(TE)6894	6238

26294 7590 11/23/2007
TAROLLI, SUNDHEIM, COVELL & TUMMINO L.L.P.
1300 EAST NINTH STREET, SUITE 1700
CLEVEVLAND, OH 44114

EXAMINER	
FUJITA, KATRINA R	

ART UNIT	PAPER NUMBER
2624	

MAIL DATE	DELIVERY MODE
11/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/772,655	LUO ET AL.
	Examiner	Art Unit
	Katrina Fujita	2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 27 August 2007.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-28 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-28 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office Action is responsive to Applicant's remarks received on August 30, 2007. Claims 1-28 remain pending.

Response to Arguments

2. Applicant's arguments, see pages 10-12, filed on August 30, 2007, with respect to the rejection(s) of claim(s) 1-4, 7 and 9-12 under 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art references which describe the claimed subject matter as shown in the rejections below.

Specification

3. The abstract of the disclosure is objected to because it contains reference numerals from the drawings. Correction is required. See MPEP § 608.01(b).

Claim Suggestions

4. The previous claim suggestion has been withdrawn in light of Applicant's amendment.

Claim Objections

5. The previous claim objections have been withdrawn in light of Applicant's amendment.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-5, 7-10, 19-23, and 25-28 rejected under 35 U.S.C. 102(b) as being anticipated by Murphey et al. ("Feature Extraction for a Multiple Pattern...", IEEE Article).

Regarding **claim 1**, Murphey et al. discloses a system for selectively generating training data for a pattern recognition classifier ("multiple pattern classification neural network system" at section 3, line 1) from a plurality of training images representing an output class ("k sets of training images T_{r1}, T_{r2},...,T_{rk}, where images in T_{ri} belong to class i" at section 2, paragraph 2, line 1), said system comprising:

an image synthesizer that combines the plurality of training images into a class composite image ("generates a feature image for every class of patterns" at page 221, left column, line 5);

a grid generator that generates a grid pattern representing the output class from the class composite image ("refining segment grids in each class feature image" at page 221, right column, line 9); and

a feature extractor that extracts feature data from the plurality of training images according to the generated grid pattern ("computing the features from subimages defined by these grids" at page 221, right column, fourth full paragraph, line 6).

Regarding **claim 2**, Murphey et al. discloses a system wherein the grid generator generates the grid pattern according to at least one attribute of interest associated with the class composite image ("In order to emphasize the areas that have distinct features of each class, the dynamic grids finding algorithm uses an iterative procedure that increases the resolution of important feature area" at page 221, right column, line 6).

Regarding **claim 3**, Murphey et al. discloses a system wherein the grid pattern divides the class composite image into a plurality of sub-images ("divided the class feature image, say feature_image_cl_i for class i, into a coarse scale subimages" at page 221, right column, line 13), the feature extractor extracting data relating to each of the plurality of sub-images ("computing the features from subimages defined by these grids" at page 221, right column, fourth full paragraph, line 6).

Regarding **claim 4**, Murphey et al. discloses a system wherein the grid generator operates according to a grid generation algorithm to select one of the plurality of sub-images according to an attribute of interest ("iterative procedure that looks for the subimage j that has the greatest energy" at page 221, right column, second full paragraph, line 5) and modifies the grid pattern according to the selected sub-image ("Once the subimage j is found and assume the subimage has size $2^{kj}X2^{kj}$, then the subimage is divided into 4 new subimages" at page 221, third full paragraph, line 1).

Regarding **claim 5**, Murphey et al. discloses a system wherein the attribute of interest is a maximum average grayscale value out of a plurality of average grayscale values associated with respective sub-images ("average value of each subimage" at page 221, right column, fourth full paragraph, line 12; "gray scale intensity images" at page 221, left column; "subimage j that has the greatest energy" at page 221, right column, second full paragraph, line 6).

Regarding **claim 7**, Murphey et al. discloses a system wherein the grid pattern is modified as to divide the selected sub-image into a plurality of sub-images ("the subimage is divided into 4 new subimages" at page 221, third full paragraph, line 2).

Regarding **claim 8**, Murphey et al. discloses a system wherein the grid pattern is iteratively modified until a grid pattern that divides the class composite image into a threshold number of sub-images has been generated ("The above process repeats until the number of subimages exceeds a preset number" at page 221, right column, third full paragraph, line 3).

Regarding **claim 9**, Murphey et al. discloses a system further comprising a pattern recognition classifier that is trained using the extracted feature data ("class grids obtained by the above procedure are used to training classifiers" at page 222, left column, first paragraph 1, line 1).

Regarding **claim 10**, Murphey et al. discloses a system wherein the pattern recognition classifier includes at least one of a neural network and a support vector machine ("multi layered neural network" at page 222, left column, first paragraph, line 4).

Regarding **claim 11**, Murphey et al. discloses a system further comprising an image source that provides the plurality of training images (figure 1, "Training data").

Regarding **claim 19**, Murphey et al. discloses a method for selectively generating training data for a pattern recognition classifier ("multiple pattern classification neural network system" at section 3, line 1, which performs the method) from a plurality of training images representing a desired output class ("k sets of training images T_{r1}, $T_{r2}, \ldots, T_{rk}$, where images in T_{ri} belong to class i" at section 2, paragraph 2, line 1), said method comprising the steps of:

generating a representative image that represents the output class ("generates a feature image for every class of patterns" at page 221, left column, line 5);

dividing the representative image according to an initial grid pattern to form a plurality of sub-images ("divided the class feature image, say feature_image_cl_i for class i, into a coarse scale subimages" at page 221, right column, line 13);

identifying at least one sub-image formed by said grid pattern having at least one attribute of interest ("iterative procedure that looks for the subimage j that has the greatest energy" at page 221, right column, second full paragraph, line 5);

modifying said grid pattern in response to the identified at least one sub-image having said at least one attribute of interest so as to form a modified grid pattern ("Once the subimage j is found and assume the subimage has size $2^{kj}X2^{kj}$, then the subimage is divided into 4 new subimages" at page 221, third full paragraph, line 1); and

using the modified grid pattern to extract respective feature vectors from the plurality of training images ("computing the features from subimages defined by these grids" at page 221, right column, fourth full paragraph, line 6).

Regarding **claim 20**, Murphey et al. discloses a method wherein the step of generating a representative image includes combining the plurality of training images to form a class representative image class ("generates a feature image for every class of patterns" at page 221, left column, line 5).

Regarding **claim 21**, Murphey et al. discloses a method where the step of generating a representative image includes averaging grayscale values across corresponding pixels in the plurality of training images ("average value of each

subimage" at page 221, right column, fourth full paragraph, line 12; "gray scale intensity images" at page 221, left column).

Regarding **claim 22**, Murphey et al. discloses a method wherein the step of modifying the grid pattern includes modifying the grid pattern to divide the identified sub-images into respective pluralities of sub-images ("the subimage is divided into 4 new subimages" at page 221, third full paragraph, line 2).

Regarding **claim 23**, Murphey et al. discloses a method wherein the at least one attribute of interest includes an average grayscale value associated with a sub-image that exceeds a threshold value ("iterative procedure that looks for the subimage j that has the greatest energy" at page 221, right column, second full paragraph, line 5; "average value of each subimage" at page 221, right column, fourth full paragraph, line 12; "gray scale intensity images" at page 221, left column).

Regarding **claim 25**, Murphey et al. discloses a method wherein the at least one attribute of interest includes a maximum average grayscale value out of a plurality of average grayscale values associated with respective sub-images ("average value of each subimage" at page 221, right column, fourth full paragraph, line 12; "gray scale intensity images" at page 221, left column; "subimage j that has the greatest energy" at page 221, right column, second full paragraph, line 6).

Regarding **claim 26**, Murphey et al. discloses a method wherein the step of using the modified grid pattern to extract respective feature vectors from the plurality of training images includes applying the modified grid pattern to a training image to form a plurality of sub-images from the training image ("divided the class feature image, say

feature_image_cl_i for class i, into a coarse scale subimages" at page 221, right column, line 13) and extracting at least one element associated with a respective feature vector from each of the plurality of sub-images ("feature vector orf an image in either training data or test data is formed by superimposing the grids to the image and then computing the features from subimages defined by these grids" at page 221, right column, fourth full paragraph, line 3).

Regarding **claim 27**, Murphey et al. discloses a method wherein the steps of identifying at least one sub-image and modifying the grid pattern in response to the identified sub-image are repeated iteratively until a termination event is recorded ("The above process repeats until the number of subimages exceeds a preset number" at page 221, right column, third full paragraph, line 3).

Regarding **claim 28**, Murphey et al. discloses a method wherein the termination event comprises producing a modified grid that divides the class composite image into a threshold number of sub-images ("The above process repeats until the number of subimages exceeds a preset number" at page 221, right column, third full paragraph, line 3).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murphey et al.

Murphey et al. discloses the elements of claim 4 as described in the 102 rejection above.

Murphey et al. does not explicitly disclose that the attribute of interest is a maximum grayscale variance out of a plurality of grayscale variances associated with the respective sub-images.

However, as shown in the disclosure of Murphey et al., depending on the input image type, an appropriate feature type may employed for optimum results ("For different types of training images, one can use feature image differently" at page 221, left column). Furthermore, Murphey et al. discloses the use of average grayscale values as the attribute of interest as described above.

Therefore, choosing maximum grayscale variance as the attribute of interest would have been obvious at the time the invention was made to one of ordinary skill in the art as the variance of a sample is directly applicable to the average of the sample and would better distinguish between types of training images.

10. Claims 12-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Murphey et al. and Owechko et al. (US 6,801,662).

Regarding **claim 12**, Murphey et al. discloses the elements of claim 11 as described in the 102 rejection above.

Murphey et al. does not disclose that the image source includes a stereo camera system.

Owechko et al. teaches a system for selectively generating training data for a pattern recognition classifier from a plurality of training images representing an output class ("systems and methods for detection and classification of objects for use in control of vehicle systems, such as air bag deployment systems" at col. 1, line 8; "sensor fusion engine according to the present invention was trained with eleven-dimensional data collected from Hausdorff, edge, and motion classifiers" at col. 15, line 29) wherein the image source includes a stereo camera system ("stereo imaging system" at col. 7, line 58; "Means for capturing images of an area may comprise CMOS or CCD camera" at col. 3, line 10).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the stereo camera system of Owechko et al. to provide the training images of Murphey et al. to provide "the ability to measure the depth of objects and surfaces in the area" (Owechko et al. at col. 7, line 65) and to not "lose the head track and start tracking the occupant's hands" (Owechko et al. at col. 7, line 45).

Regarding **claim 13**, Murphey et al. discloses a system for selectively generating training data for a pattern recognition classifier ("multiple pattern classification neural network system" at section 3, line 1) associated with a vehicle occupant safety system

("trained the system to classify occupant inside a vehicle" at section 3, line 3) comprising:

a plurality of training images representing an output class ("k sets of training images T_{r1}, T_{r2},...,T_{rk}, where images in T_{ri} belong to class i" at section 2, paragraph 2, line 1);

a grid generator that generates a grid pattern representing the output class ("refining segment grids in each class feature image" at page 221, right column, line 9) from a class composite image ("class feature image" at page 221, left column, at "step 3"); and

a feature extractor that extracts training data from the plurality of training images according to the generated grid pattern ("computing the features from subimages defined by these grids" at page 221, right column, fourth full paragraph, line 6).

Murphey et al. does not disclose a vision system that images the interior of a vehicle to provide the plurality of training images.

Owechko et al. teaches a system for selectively generating training data for a pattern recognition classifier associated with a vehicle occupant safety system ("systems and methods for detection and classification of objects for use in control of vehicle systems, such as air bag deployment systems" at col. 1, line 8; "sensor fusion engine according to the present invention was trained with eleven-dimensional data collected from Hausdorff, edge, and motion classifiers" at col. 15, line 29) comprising a vision system ("vision-based system" at col. 2, line 39) that images the interior of a

vehicle to provide the plurality of training images ("For viewing the front portion of a vehicle occupancy area" at col. 7, line 60).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the vision system of Owechko et al. to provide the training images of Murphey et al. to provide "the ability to measure the depth of objects and surfaces in the area" (Owechko et al. at col. 7, line 65) and to not "lose the head track and start tracking the occupant's hands" (Owechko et al. at col. 7, line 45).

Regarding **claim 14**, Murphey et al. discloses a system further comprising an image synthesizer that combines the plurality of training images to provide the class composite image ("generates a feature image for every class of patterns" at page 221, left column, line 5).

Regarding **claim 15**, Murphey et al. discloses a system wherein the plurality of training images representing the output class includes images of a human adult seated within the vehicle interior ("There were four different classes of patterns, adult, child empty seat and rear facing infant seas (Rfis)" at section 3, line 4).

Regarding **claim 16**, Murphey et al. discloses a system wherein the plurality of training images representing the output class includes images of a rearward facing infant seat positioned within the vehicle interior ("There were four different classes of patterns, adult, child empty seat and rear facing infant seas (Rfis)" at section 3, line 4).

Regarding **claim 17**, Owechko et al. discloses a system wherein the plurality of training images representing the output class includes images of a human head (figure 4).

11. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Murphey et al. and Owechko et al. as applied to claim 13 above, and further in view of Krumm (US 5,983,147).

The Murphey et al. and Owechko et al. combination discloses the elements of claim 13 as described in the 103 rejection above.

The Murphey et al. and Owechko et al. combination does not disclose that the stereo vision system produces three-dimensional image data of the vehicle interior as a stereo disparity map.

Krumm teaches a system for selectively generating training data for a pattern recognition classifier ("This system was tested in a vehicle that had been trained with approximately 100 images of each situation" at col. 5, line 14) associated with a vehicle occupant safety system ("present invention relates generally to automotive vehicle occupant restraint systems, particularly air bags" at col. 1, line 14) comprising a vision system comprising a stereo vision system (figure 1, numeral 26) produces three-dimensional image data of the vehicle interior as a stereo disparity map ("disparity image--one that gives disparity values at every point in the image" at col. 6, line 17; "disparity images are functions of 3D structure" at col. 7, line 31).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the disparity map of Krumm to represent the image data of the Murphey et al. and Owechko et al. combination as "they do not need the preprocessing

normalization and histogram steps utilized on the intensity images" (Krumm at col. 7, line 32).

12. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murphey et al. in view of common knowledge in the art as evidenced by Jackway et al. (US 2002/0051571).

Murphey et al. discloses the elements of claim 22 as described in the 102 rejection above.

Murphey et al. does not explicitly disclose that the at least one feature value includes a coarseness measure associated with each sub-image.

However, as shown in the disclosure, depending on the input image type, an appropriate feature type may be employed for optimum results ("For different types of training images, one can use feature image differently" at page 221, left column). The method of Murphey et al. discloses the use of texture images as a possible type of training image ("texture image" at section 2, paragraph 2, line 4).

Accordingly, it would have been obvious at the time the invention was made of one of ordinary skill in the art to use coarseness as a feature value when evaluating texture images as "Image texture can be qualitatively evaluated as having one or more of the properties of fineness, coarseness" (Jackway et al. at paragraph 0004, line 6).

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 2004/0153229, US 6,856,873 are both pertinent as teaching vehicle restraining systems containing training systems.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katrina Fujita whose telephone number is (571) 270-1574. The examiner can normally be reached on M-Th 8-5:30pm, F 8-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KF

Katrina Fujita
Art Unit 2624

VIKKRAM BALI
PRIMARY EXAMINER